

Remarks

Claims 1-24 were originally filed and are pending.

Rejection Under 35 U.S.C. Section 112

Claims 1 and 9 were rejected under the second paragraph of Section 112 as being indefinite. The rejection is respectfully traversed for the following reasons.

The Examiner has stated that it is not clear that the term "polymer-bound" (in reference to a base) can cover a base that is bonded to an inorganic particle. Applicants refer the Examiner, however, to the definition of "polymer-bound" set forth at page 4, lines 15-16, of Applicants' specification. The term "polymer-bound means covalently bonded to a solid, organic polymer or inorganic particle that is substantially insoluble in the cationically curable composition." In view of this definition, Applicants respectfully submit that the term is indeed clear and respectfully request that the rejection under Section 112 be withdrawn.

Rejection Under 35 U.S.C. Section 102

Claims 1-5, 8-10, 13-15, 18, 20, and 22 were rejected under Section 102(a) as being anticipated by EP 1 348 742 A2 and under Section 102(e) as being anticipated by Spera et al. (U.S. Patent Application Publication No. US 2003/0194560 A1, the U.S. counterpart of EP 1 348 742 A2; hereinafter, collectively addressed by reference to Spera et al.). This rejection is respectfully traversed for the following reasons.

Applicants claim a composition comprising:

- (a) at least one cationically curable species;
- (b) at least one cationic photoinitiator; and
- (c) at least one encapsulated, polymer-bound base.

(See Claim 1.) As mentioned above, the base of component (c) of the composition is covalently bonded to a solid, organic polymer or inorganic particle.

In contrast, Spera et al. describe coating powders comprising a solid, particulate film-forming composition and encapsulated catalysts. The film-forming composition can be a low-temperature cure coating powder such as an epoxy thermosetting resin and an optional catalyst. Catalysts useful to accelerate the cure of the epoxy resin are said to include, for example,

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imidazoles, tetrasubstituted organoborate salts, polyamines, and phenolics. (See, for example, paragraphs [0022] through [0030].)

Spera et al. state (at paragraph [0037]) that "[i]t has been found by the inventors hereof that use of a catalyst coated with or encapsulated in a polymeric material immiscible with the catalyst physically isolates the catalyst from the film forming polymer components." Useful encapsulants are said to include wax and thermoplastic polymer (both of which can be melted in the presence of the catalyst and then cooled to effect solidification), as well as the reaction product of a microgel that contains carboxylic acid functional groups with a nitrogen-containing catalyst (see paragraphs [0038] through [0043]).

The Examiner has asserted that Spera et al. disclose compositions comprising components corresponding to components a, b, and c of the instant claims. Even if one assumes for purposes of argument, however, that both components a and b are described by Spera et al., component c is missing. The Examiner is overlooking the limitation "polymer-bound" that is recited in Applicants' claims in regard to component (c): "at least one encapsulated, polymer-bound base." (See, for example, Claim 1.)

Applicants again refer the Examiner, to the definition of "polymer-bound" set forth at page 4, lines 15-16, of Applicants' specification. The term "polymer-bound means covalently bonded to a solid, organic polymer or inorganic particle that is substantially insoluble in the cationically curable composition."

In contrast, the encapsulated catalysts described by Spera et al. either have no chemical bonding between the catalyst and the encapsulant (when wax or a thermoplastic polymer is used) or have ionic bonding between a nitrogen-containing catalyst and a microgel that contains carboxylic acid functional groups. The latter encapsulated catalyst is a "microgel amine salt" (see, for example, column 3, lines 27-31, and column 4, line 42, of U.S. Patent No. 6,274,673 (Roth et al.; referenced at paragraph [0043] of Spera et al.; copy enclosed)).

Since salts of carboxylic acids are ionically bonded (see the enclosed copy of pages 582-583 of Organic Chemistry by Morrison and Boyd, Second Edition, Allyn and Bacon, Inc., Boston (1966)), Spera et al. fail to teach or suggest the use of Applicants' component (c), a polymer-bound base. Applicants therefore respectfully submit that their claimed invention is indeed patentable over Spera et al. and respectfully request that the rejections under Section 102 be withdrawn.

**Rejections Under 35 U.S.C. Section 103**

Claims 11, 12, 16, 19, 21, and 23 were rejected under Section 103(a) as being unpatentable over EP 1 348 742 A2 or Spera et al., as applied above, and further in view of Hoffman et al. (U.S. Patent No. 6,224,793). This rejection is respectfully traversed for the following reasons.

Hoffman et al. describe an encapsulated active agent comprising an active agent encapsulated in a crystallizable or thermoplastic polymer, wherein the particle size of the encapsulated active agent is 3,000 microns or less, and wherein the active agent is not significantly extractable from the particles under ambient conditions. The active agent "can be any material that is reactive in an environment and which needs to be separated from the environment until it is desired that the active agent react in the environment" (see column 3, lines 61-64). Preferably, the active agent is a catalyst, a curing agent, an accelerator, or a mixture thereof.

The Examiner has asserted that it would have been obvious to employ the encapsulated active agent of Hoffman et al. as the encapsulated catalyst in the composition of Spera et al.. Hoffman et al. do nothing, however, to overcome the above-described deficiencies of Spera et al..

Applicants refer the Examiner to column 3, lines 21-22, of Hoffman et al., which state that "[p]referably, the active agent is not chemically bound to the encapsulating agent." Hoffman et al. teach away from the use of chemical bonding of any sort (between the active agent and the encapsulant), including the covalent bonding of Applicants' polymer-bound bases. Applicants therefore respectfully submit that their claimed invention is indeed patentable over this combination of references and respectfully request that the rejection under Section 103 be withdrawn.

Claims 6, 7, and 24 were rejected under Section 103(a) as being unpatentable over EP 1 348 742 A2 or Spera et al., as applied above, and further in view of Lamon et al. (U.S. Patent No. 6,565,969). This rejection is respectfully traversed for the following reasons.

Lamon et al. describe an adhesive article comprising a bondable layer and a pressure sensitive adhesive layer on at least one major surface of the bondable layer, as well as an assembly comprising one or more substrates and the adhesive article. The bondable layer can comprise an epoxide, and a lengthy list of useful curatives is set forth at columns 13 and 14. The list includes encapsulated aliphatic amines and polymer bound amines or imidazoles. Lamon et al. further state (at column 13, lines 16-17) that "[i]t is also possible to use two or more curatives in combination."

The Examiner has asserted that it would have been obvious to select a combination of nitrogen-containing curatives such as encapsulated amines or polymer-bound amines or imidazoles and photochemically activated curatives, as Lamon et al. teach that the disclosed curatives can be used in combination. The Examiner is overlooking the fact, however, that these two classes of materials function as curatives in two different types of curing mechanisms.

The photochemically activated curatives for epoxide polymerization that are described by Lamon et al. at column 14 are cationic photocatalysts, whereas the encapsulated amines and polymer-bound amines and imidazoles function as curatives in an anionic curing mechanism. Thus, one skilled in the art would not pair these two classes of curatives. Not only do they cure by different mechanisms, but it is known that the latter class can inhibit the effectiveness of the former. (See, for example, the discussion concerning bases in Applicants' specification at pages 1 and 2.)

In addition, when Lamon et al. actually do combine curatives in Example 5 (referenced by the Examiner), the materials combined are a thermal anionic curative (micronized dicyandiamide) and an accelerator for anionic cure (methylene diisocyanate urea cure accelerator). It does not appear therefore that Lamon et al. either teach or suggest Applicants' claimed composition, and Applicants' respectfully request that the rejection under Section 103 be withdrawn.

Claims 17 was rejected under Section 103(a) as being unpatentable over EP 1 348 742 A2 or Spera et al. in view of Hoffman et al. (U.S. Patent No. 6,224,793), as applied above, and further in view of Lamon et al. (U.S. Patent No. 6,565,969). This rejection is respectfully traversed for the following reasons.

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The Examiner has asserted that (a) it would have been obvious to select a combination of nitrogen-containing curatives such as encapsulated amines or polymer-bound amines or imidazoles and photochemically activated curatives such as onium salts or organometallic salts from the curatives taught by Lamon et al., as Lamon et al. teach that the disclosed curatives can be used in combination; and (b) it would have been obvious to employ such a combination in the epoxy composition taught by Spera et al. in combination with Hoffman et al. Since (a) would not have been obvious for at least the reasons described above, Applicants respectfully submit that this rejection also fails and respectfully request that it be withdrawn.

**Concluding Remarks**

Reconsideration and allowance of Applicants' claims are respectfully requested. Applicants thank the Examiner for the returned copies of Information Disclosure Statements that have been signed by the Examiner. Some of the references on these Statements have not been initialed, however, and Applicants respectfully request confirmation that all references have indeed been considered.

Respectfully submitted,

September 23, 2005  
Date

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Enclosure

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# *Organic Chemistry*

*Second Edition*

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and

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**Allyn and Bacon, Inc.**

*Boston*

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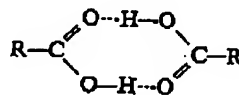
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## 582 Ch. 18 / Carboxylic Acids

twenty degrees higher than the alcohol of comparable molecular weight,  $n$ -butanol (b.p. 118°). These very high boiling points are due to the fact that a pair of carboxylic acid molecules are held together not by one but by two hydrogen bonds:

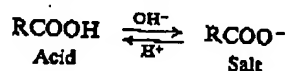


**Problem 18.1** At 110° and 454 mm pressure, 0.11 g acetic acid vapor occupies 63.7 cc; at 156° and 458 mm, 0.081 g occupies 66.4 cc. Calculate the molecular weight of acetic acid in the vapor phase at each temperature. How do you interpret the results?

The odors of the lower aliphatic acids progress from the sharp, irritating odors of formic and acetic acids to the distinctly unpleasant odors of butyric, valeric, and caproic acids; the higher acids have little odor because of their low volatility.

## 18.4 Salts of carboxylic acids

Although much weaker than the strong mineral acids (sulfuric, hydrochloric, nitric), the carboxylic acids are tremendously more acidic than the very weak organic acids (alcohols, acetylene) we have so far studied; they are much stronger acids than water. Aqueous hydroxides therefore readily convert carboxylic acids into their salts; aqueous mineral acids readily convert the salts back into carboxylic acids. Since we can do little with carboxylic acids without encountering



this conversion to and from their salts, it is worthwhile for us to examine the properties of these salts.

Salts of carboxylic acid—like all salts—are crystalline non-volatile solids made up of positive and negative ions; their properties are what we would expect of such structures. The strong electrostatic forces holding the ions in the crystal lattice can be overcome only by heating to a high temperature, or by a very polar solvent. The temperature required for melting is so high that before it can be reached carbon-carbon bonds break and the molecule decomposes, generally in the neighborhood of 300–400°. A decomposition point is seldom useful in the identification of a compound, since it usually reflects the rate of heating rather than the identity of the compound.

The alkali metal salts of carboxylic acids (sodium, potassium, ammonium) are soluble in water but insoluble in non-polar solvents; most of the heavy metal salts (iron, silver, copper, etc.) are insoluble in water.

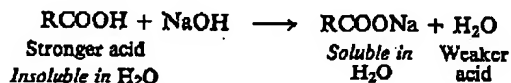
Thus we see that, except for the acids of four carbons or less, which are soluble both in water and in organic solvents, carboxylic acids and their alkali metal salts show exactly opposite solubility behavior. Because of the ready interconversion



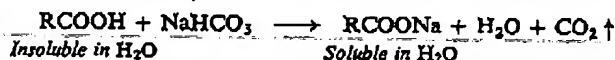
## 18.5 / Industrial source 583

acids and their salts, this difference in solubility behavior may be used in two important ways: for *identification* and for *separation*.

A water-insoluble organic compound that dissolves in cold dilute aqueous sodium hydroxide must be either a carboxylic acid or one of the few other kinds of organic compounds more acidic than water; that it is indeed a carboxylic acid can then be shown in other ways.



Instead of sodium hydroxide, we can use aqueous sodium bicarbonate; even if the unknown is water-soluble, its acidity is shown by the evolution of bubbles of  $\text{CO}_2$ .



We can separate a carboxylic acid from non-acidic compounds by taking advantage of its solubility and their insolubility in aqueous base; once the separation has been accomplished, we can regenerate the acid by acidification of the aqueous solution. If we are dealing with solids, we simply stir the mixture with aqueous base and then filter the solution from insoluble, non-acidic materials; addition of mineral acid to the filtrate precipitates the carboxylic acid, which can be collected and filtered. If we are dealing with liquids, we shake the mixture with aqueous base in a separatory funnel and separate the aqueous layer from the insoluble organic layer; addition of acid to the aqueous layer again liberates the carboxylic acid, which can then be separated from the water. For completeness of separation and ease of handling, we often add a water-insoluble solvent like ether to the acidified mixture. The carboxylic acid is extracted from the water by the ether, in which it is more soluble; the volatile ether is readily removed by distillation from the comparatively high-boiling acid.

For example, an aldehyde prepared by the oxidation of a primary alcohol (Sec. 16.7) may very well be contaminated with the carboxylic acid; this acid can be simply washed out with dilute aqueous base. The carboxylic acid prepared by oxidation of an alkylbenzene (Sec. 12.11) may very well be contaminated with unreacted starting material; the carboxylic acid can be taken into solution by aqueous base, separated from the insoluble hydrocarbon, and regenerated by addition of mineral acid.

Since separations of this kind are more clear-cut and less wasteful of material, they are preferred wherever possible over recrystallization or distillation.

## 18.5 Industrial source

As usual, the lowest members of the family are prepared by special methods. Formic acid is synthesized on a large scale by the reaction between carbon monoxide and aqueous sodium hydroxide at high temperature and pressure.

